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(54) Title: METHOD AND APPARATUS FOR PRINTING TEXTILE LABELS, IN PARTICULAR HEAT-SEALABLE TEXTILE LABELS

(57) Abstract

A method for printing a textile label (1, 21), provided with at least a top layer (6, 26), which top layer (6, 26) comprises at least a synthetic material, and ink-sorbing means (13, 23, 30), comprises the following steps: providing a printing by means of ink (15) of the subliming or transfer type, which ink (15) is directly provided on the textile label (1, 21) and absorbed or at least retained by the ink-sorbing means (13, 23, 30); heating the textile label (1, 21) so that the ink (15) is at least substantially transferred from or out of the ink-sorbing means (13, 23, 30) to the synthetic material (14, 24); and cooling the textile label (1, 21) so that the ink (15) is fixedly connected to the synthetic material (14, 24).

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Title: Method and apparatus for printing textile labels, in particular heat-sealable textile labels.

The invention relates to a method for printing textile labels. Such method is known from practice.

In the known method, a mirror image of a desired print is printed on paper by means of transfer ink. Next, this paper is pressed with the print against a surface to be printed and heated in such a manner that the transfer ink is absorbed in the synthetic fibers of the surface to be printed. After cooling, the ink is retained in the synthetic fibers. This enables a thus printed product to be for instance laundered industrially and dry-cleaned.

This known method has as a drawback that a relatively large number of processing steps are necessary to obtain the desired result. Consequently, this known method is laborious and relatively costly in use. Moreover, a mirror print has the drawback that it is difficult to check by a user. After all, in particular text will become difficult to read. A further drawback of this known method is that the printed product and the paper must be heated together, preferably through the paper. As a result, heating should take place for a relatively long period, which may have disadvantageous effects in particular for synthetic fibers in the surface to the printed, while moreover, a flow of the ink may occur, which may cause the print on the printed product to become slightly blurred.

Further, a method is known from practice for printing textile labels, wherein, via for instance screen-printing techniques, an image is provided on the top side of a textile label by means of paint. The paint substantially remains lying as a film on the textile label and is hence relatively susceptible to damage, in particular during for instance industrial laundering and dry-cleaning, but also during normal use. Moreover, in this known method, a separate screen should be manufactured for each printing, which is a time-consuming and costly affair, while, as a consequence, users

themselves cannot use this method individually without making costly investments therefor in, for instance, equipment and trainings. A further limitation of this known method is that relatively viscous types of paint must be used in order to obtain sufficiently sharp prints, which decreases the freedom of design for the user considerably.

The object of the invention is to provide a method of the type mentioned in the opening paragraph, in which the drawbacks mentioned are avoided and the advantages thereof are retained. To that end, a method according to the invention is characterized by the features of claim 1.

With a method according to the invention, a printing can be provided directly, i.e. without the interposition of a mirror print functioning as stencil, on a textile label by means of the subliming or transfer ink. Surprisingly, it has been found that through the use of textile that comprises, in addition to the conventional synthetic fibers, ink-sorbing means, the ink is retained by the textile label, before as well as after the heating of the textile label for sorption of the ink in the synthetic fibers. This surprising effect occurs in that during the application at a relatively low temperature, the ink is sorbed and retained by the ink-sorbing means in such a manner that flowing and smearing of the ink are prevented, while when the textile label is sufficiently heated, the ink is released by the ink-sorbing means and sorbed by the synthetic fibers, involving a high degree of bonding between the ink and the synthetic fibers. As a result, the thus printed textile label can be manufactured in a simple, economical manner while it is still washable, in particular through industrial laundering or dry-cleaning.

As already appears from the foregoing, the term 'textile' should at least be understood to include material which is at least partly manufactured from for instance synthetic fibers and/or natural fibers through for instance weaving, knitting, crocheting or the like. The term 'textile

label' should at least be understood to include a piece of textile that can for instance be used for marking, repairing or decorating a product, in particular a textile product such as clothing and the like, or for informative purposes.

In further elaboration, a method according to the invention is characterized by the features of claim 2.

The ink-sorbing means offer the advantage that at a relatively low temperature, the ink is already sufficiently retained by the textile label, so that afterwards only the textile label, in particular only the ink-carrying layer thereof, should be heated in order to cause the ink to be sorbed in the synthetic fibers in a suitable manner. After that, the synthetic fibers provide an adequate protection of the printing.

In an advantageous embodiment, a method according to the invention is characterized by the features of claim 3.

By providing a textile label with at least a top layer that is composed of synthetic fibers and ink-absorbing fibers, preferably natural fibers, or that at least comprises such fibers, a textile label having a suitable, preferably regular distribution of the different materials can readily be obtained. Thus, a great accuracy can be obtained in the printings to be provided, with a great sharpness.

In an alternative embodiment, a method is characterized by the features according to claim 5.

By providing the textile label with a top layer manufactured from synthetic fibers that are at least partly provided with for instance an ink-sorbing coating, the textile label can readily be manufactured and provided with the desired quantity of ink-sorbing means at the desired positions.

In a preferred embodiment, a method according to the invention is characterized by the features of claim 7.

By using a printer for printing the textile labels, a user is offered the possibility of producing individually determined textile labels in a particularly simple manner,

for instance on a computer screen. For that purpose, the user can use his own designs, as well as pre-inputted designs and combinations thereof. Printings can easily be adjusted in for instance position, format, number, color and the like, without a new printing stencil having to be manufactured therefor each time. Moreover, several textile labels can readily be manufactured simultaneously. Precisely a method according to the invention involves the possibility of choosing from a large number of different printers, depending on the users' individual requirements and wishes.

In a particularly advantageous further embodiment, a method according to the invention is further characterized by the features of claim 10.

The use of a heat-sealable textile label offers the advantage that the textile label can readily be affixed in for instance a textile product. By providing a backing on the backside of the textile label, i.e. on the side that is not to be printed, the heat-sealable layer that is conventionally provided on the side in question is suitably protected against damaging and fouling. Moreover, by rendering the backing in question heat-insulating, the advantage is achieved that during the printing of the textile label and/or the possibly subsequent heating for causing the ink to transfer to the synthetic fibers, the heat-sealable layer is easily and suitably protected against undue heating. Indeed, this layer must not be heated in such manner until the textile label is to be secured in or on a suitable product through heat-sealing.

In this context, 'heat-sealing' should at least be understood to mean heating a thermally bondable layer or like means in such a manner that the textile label is fixed on a product by these thermally bondable means, for instance through a thermal reaction between polymers and the product or through melting.

By affixing, by means of an adhesive layer, the backing on the backside of the textile label, preferably against the

thermally bondable layer, in such a manner that the backing can simply be detached while the adhesive means retain their adhesive action at least until the heat-sealing, the advantage is achieved that the backing is readily maintained in the protective condition, while the textile label, after removal of the backing, can readily be affixed, temporarily and detachably, in or on a product, for instance for illustration, as a test or as presentation aid, while the adhesive means moreover provide, during heat-sealing, that the textile label remains in the desired position.

The invention further relates to an apparatus for use with a method according to the invention, which apparatus is characterized by the features of claim 12. The invention moreover relates to an ink container for use in an apparatus according to the invention, characterized by the features of claim 13, and a textile label suitable for use with a method according to the invention.

Further advantageous embodiments of methods and apparatus are represented in the specification and the claims.

To explain the invention, exemplary embodiments of methods and an apparatus will hereinafter be described, with reference to the accompanying drawings. In these drawings:

Fig. 1 schematically shows a textile label in an apparatus according to the invention;

Fig. 2 is a top plan view of a portion of a textile label according to the invention, in a first embodiment;

Fig. 3A shows a cross section of a textile label taken on the line III-III in Fig. 2, with a printing applied thereto, before heating or transferring ink;

Fig. 3B shows a textile label taken on the line III-III in Fig. 2, after heating or transfer of the ink;

Fig. 4 shows a cross section of a textile label according to the invention, in a second embodiment.

Fig. 1 schematically shows a textile label 1 included in a printing apparatus 2, comprising means for directly

transferring ink onto the textile label 1, for instance a printer of the bubble jet, ink jet or laser type. For that purpose, the printer 2 comprises a printer head 3 and one or preferably several ink containers 4, each filled with ink of the transfer or subliming type, preferably in different colors. The printer 2 is controllable by means of a control device 5, shown in Fig. 1 in the form of a computer.

The textile label 1 is built up of a top layer 6, comprising at least synthetic fibers and ink-sorbing means. This top layer 6 will be further discussed hereinbelow. Provided below the top layer 6 is a thermally bondable layer 7 that is preferably formed by a thermoplastic layer, for instance manufactured from polymers such as polyurethane, polyester urethane, polyether urethane or polyester. Preferably, this layer extends below the entire surface of the top layer 6 and is suitable for affixing a textile label 1 on, for instance, textile by means of heat-sealing, a heat treatment in which, through heating to for instance above 60°C, preferably above 90°C, and subsequent cooling, the thermally bondable layer 7 forms a chemical and/or mechanical bond with a bonding surface on which the textile label is printed. Provided below the thermally bondable layer 7 is an adhesive layer 8, for instance formed from a pressure-sensitive type of adhesive such as acrylates. The adhesive layer 8 comprises a pressure-sensitive adhesive and is adapted to at least adhere the label 1 to a bonding surface between 0°C and 60°C, to temporarily and detachably position the label 1 thereon and to retain the label on the bonding surface during a following heating of the label 1 for gluing it definitively onto the bonding surface by means of the thermally bondable layer 7. This adhesive layer 8, too, extends at least along the edges of the label and preferably below the entire surface of the top layer 6. In practice, sealing temperatures of 200°C or more can be suitable.

By means of the adhesive layer 8, the textile label is detachably connected to a backing 9, for instance

manufactured from paper, synthetic material or textile. As shown in Fig. 1, a series of textile labels 1 are provided on one backing 9 one behind the other, in feed-through direction P of the printer. Similarly, textile labels 1 can be provided on a backing 9 side by side, in such a manner that rows and/or columns of textile labels are obtained on one backing 9, while each row and/or column can comprise one or more textile labels 1 having identical or different shapes, dimensions and intended printings. By means of the backing 9 and a conveying device 10, shown schematically in Fig. 1 as two driving pressure rollers 11, the textile labels 1 can be fed through a printer 2 or a like printing apparatus. Of course, it is also possible to use a different type of printing apparatus, for instance a plotter, with the ink head 3 moving relative to a textile label that is stationary or moves along therewith, for applying the printing.

Accommodated at the downstream end, in feed-through direction, of the printer head 3 is a heating means 12 for heating at least the or each printed part of a textile label in such a manner that the printing is at least substantially dry when leaving the printer 2. A further object of this heating device 12, which may for instance also be arranged in one of the or both pressure rollers 11, will be further explained hereinbelow.

Through the use of the adhesive layer 8, a textile label 1 according to the invention can readily be adhered to a product, prior to the heat-sealing operation, in such manner that the textile label cannot shift during heat-sealing. The provision of the thermally bondable means 7 and/or the adhesive layer 8 below the entire surface of the top layer 6 ensures that during the temporary (detachable) adhering and/or heat-sealing, an optimum bond can be obtained in a particularly simple, rapid and economical manner between the textile label and the product. This prevents displacements, deformation, wrinkle formation and damages of the textile label 1 prior to and during use. As a matter of fact, it is

observed that in a method according to the invention, it is also possible to use textile labels of a different build-up, for instance without thermally bondable means, without adhesive layer and/or without backing.

Referring to Fig. 2, a first embodiment of the top layer 6 of a textile label 1 according to the invention will be described. In this embodiment, the top layer 6 is formed through weaving, knitting or a like technique, comprising alternating horizontal and vertical threads (warps and woofs). A first series of threads 13 is at least partly manufactured from ink-sorbing material, a second series of threads 14 is at least partly manufactured from a synthetic material to be further described hereinbelow.

The first series of threads 13 is for instance manufactured from natural fibers and/or ink-adsorbing or ink-absorbing materials, for instance cotton, silk, linen or wool or combinations of such materials. During a printing of the textile label, ink 15 is provided onto the top layer 6 of the textile label 1 so that the ink 15 for instance forms an at least partly covering layer on at least the first threads 13 or is partly absorbed by these threads 13. As ink 15, a transfer ink or subliming ink is used.

The synthetic material from which the second threads 14 are manufactured is of a type that slightly 'works' when the temperature increases to a temperature Tw near or above the transfer or sublimation temperature Ts of the ink 15 to be used, so that of the second threads 14 in question at least the outer layer 'opens' to allow the ink 15 to penetrate therein. Hence, the ink 15 is transferred out of or from the first series of threads 13 to the second series of threads 14. When the temperature is reduced to near or below the temperature Ts, the outer layer of the second threads 14 closes again while enclosing the ink 15. This may moreover involve a chemical reaction which further secures the ink 15 in the second threads 14. As long as the temperature Tg to which the textile label is exposed during normal usage is

lower than the temperature Tw at which the synthetic material 'works', the ink 15 will remain enclosed in the synthetic threads 14 and hence be protected against damage. Washing temperatures for textile will always be below the temperature Tw. As a result, the printing remains protected against damages and wear also in the case of repeated cleaning and long-continued use. As synthetic materials, for instance polyester, polyamide or acryl can be used. In general, washing temperatures will be lower than 100°C, sealing temperatures are generally much higher, for instance about 200°C. The working temperature is in each case higher than the washing temperature.

As thermally bondable means 7, for instance polymers such as polyurethane, polyester urethane, polyether urethane, polyester and like plastics are suitable. For the adhesive means 8, for instance pressure-sensitive types of adhesive such as acrylates can be considered. The self-adhesive layer 8 or like means must not form a barrier to the thermally bondable means 7. Hence, the adhesive means 8 should preferably be removed from the product on which the textile label is fixed during sealing and/or during subsequent cleanings, for instance through dissolving in washing water. Moreover, the thermally bondable means 7 and the adhesive means 8 can be provided side by side in thin stripes or small faces.

As material for the backing 9, for instance paper or textile is particularly suitable.

If heat-sealable (thermally bondable) textile labels are utilized, the use of the backing 9 prevents the thermally bondable means 7 from becoming too warm during the increase of the temperature of the plastic threads 14, in particular if it has good thermal insulation or if it is capable of leading away heat rapidly. This is of great significance, because undue heating of the thermally bondable means 7 during and directly after printing would cause it to become unsuitable or at least much less suitable for the contiguous

heat-sealing the textile label. Moreover, this would involve fouling of the printing apparatus 2.

Types of textile containing a combination of polyester and natural fibers, in a ratio of 20-80% polyester and 90-10% natural fibers, in particular polyester/cotton 65/35, were found to be advantageous. Of course, this example should not be construed as being limitative.

Obviously, by means of a method according to the invention, it is also possible to print textile labels that have not been provided with a thermally bondable layer and/or a self-adhesive layer. For instance, sew-in labels and self-adhesive, non-heat-sealable labels can be printed in a similar manner. A backing 9 can be entirely or partly connected to the textile labels and can cover them entirely or partly on the side facing away from the side to be printed.

Figs. 3A and 3B show a sectional side elevation of a top layer 6 according to Fig. 2, respectively before and after heating to a temperature in excess of the transfer temperature of the ink. In Fig. 3A, a part of a printing, carried out in transfer ink, is sorbed in the ink-sorbing fibers of the first threads 13. In this Figure, the ink-sorbing threads 13 are shown a threads in a first direction (at right angles to the plane of the drawing) and the synthetic second threads 14 are shown as threads in the second direction (parallel to the plane of the drawing), yet it will be understood that first and second threads can be woven or otherwise joined together in various different manners, depending on the desired distribution thereof. When the top layer 6 is heated, the structure of the synthetic second threads 14 opens, while the transfer ink 15 tends to move from the ink-sorbing threads 13 to at least the synthetic second threads 14 located next thereto. For that purpose, the ink 15 can for instance sublime through heating and be absorbed by the opening synthetic threads 14. This situation is largely shown in Fig. 3B. After the synthetic

threads 14 have cooled, they close again while enclosing the ink 15.

Fig. 4 shows a second embodiment of a top layer 26 for a textile label 21 according to the invention. Identical parts have reference numerals identical to Figs. 1 and 2 increased by twenty. In this embodiment, first 23 and second threads 24 are interwoven to form a network, and the first 23 and second threads 24 may be equal to each other and manufactured from synthetic material of the type described hereinabove. At least a number of the threads 23, 24 are provided with an ink-absorbing layer 30 over the entire surface or over only a portion thereof. When the top layer is heated to a temperature in excess of Tw, the ink 15 that is first taken up by the ink-sorbing layer 30 through, for instance, adsorption or absorption, will transfer to the synthetic cores of the threads 23, 24. In this respect, it is particularly advantageous when the ink-sorbing layer 30 subsequently disappears, for instance as a result of the increase of temperature or during a contiguous cleaning, so that the synthetic threads 23, 24 are cleared. In fact, the ink-sorbing layer 30 can also be of transparent design or become so during heating. The ink-absorbing layer can be provided on the threads 23, 24 prior to the composing of the top layer 26, but may also be provided thereon afterwards. In this manner, at the same mesh, a greater density of synthetic, ink-enclosing threads is obtained, whereby accurate, sharp prints can be produced.

The use of a heat-generating printer or a like printing apparatus has the advantage that the temperature Tw is thus reached in a suitable manner, directly following the provision of the ink on the top layer, so that the ink is directly sorbed in the synthetic threads 13, 23. This effectively prevents smearing of the ink during further treatment. This is favorable in particular when a method and textile label according to invention are used for multicolor printings, in that it prevents in a particularly advantageous

manner running of the colors, which results in particularly accurate and sharp prints.

The invention is by no means limited to the exemplary embodiments given in the drawings and the specification. Many variations thereto are possible.

For instance, several types of fibers can be used in a textile label according to the invention, while moreover, threads can be used that have for instance been spun from two or more different materials. Moreover, for instance non-wovens can be used, while prior to the provision of the print by for instance a printer, a side to be printed is wholly or partly covered with a layer of ink-sorbing material of the type described hereinabove, or is co-extruded. The heating of the top layer can be effected in many other manners, for instance through radiation heat or by means of heating pressure rollers and the like. Further, combinations of the embodiments described are of course possible. The materials, temperatures and the like mentioned as examples in the specification should not be construed as being limitative.

These and many comparable modifications are understood to fall within the framework of the invention.

Claims

1. A method for printing a textile label (1, 21), provided with at least a top layer (6, 26), which top layer (6, 26) comprises at least synthetic material, in particular interwoven synthetic fibers (14, 24) and ink-sorbing means (13, 23, 30), comprising the following steps:

providing a printing by means of ink (15) of the subliming or transfer type, said ink (15) being directly provided on the textile label (1, 21) and absorbed or at least retained by the ink-sorbing means (13, 23, 30);

heating the textile label (1, 21) so that the ink (15) is at least substantially transferred from or out of the ink-sorbing means (13, 23, 30) to the synthetic material (14, 24); and

cooling the textile label (1, 21) so that the ink (15) is fixedly connected to the synthetic material (14, 24).

2. A method according to claim 1, characterized in that at least the synthetic material (14, 24) is heated to a temperature (Tw) at which the fiber structure thereof adjacent the ink-sorbing means (13, 23, 30) is opened, wherein the ink (15) is transferred from or out of the ink-sorbing means (13, 23, 30) to the synthetic material (14, 24) and at least substantially sorbed in the synthetic material (14, 24), and wherein the textile label (1, 21) is cooled so that the fiber structure of the synthetic material (14, 24) closes while enclosing the ink (15) that forms the printing.

3. A method according to claim 1 or 2, characterized in that a textile label (1, 21) is used of which at least the top layer (6) comprises a mixture of synthetic fibers (14) and ink-sorbing fibers (13), preferably natural fibers.

4. A method according to claim 3, characterized in that a textile label (1) is used wherein the top layer (6) comprises 40-90%, more in particular 50-80%, and preferably about 65% synthetic fibers (14), in particular polyester or polyamide,

and 10-60%, more in particular 20-50%, and preferably about 35% natural fibers (13), in particular cotton.

5. A method according to claim 1 or 2, characterized in that a textile label (21) is used of which at least the top layer (26) comprises a number of synthetic fibers (23, 24), at least partly provided with a layer of ink-sorbing means (30).

6. A method according to any one of the preceding claims, characterized in that the or each printing is directly printed on the top layer (6, 26) of the or each textile label (1, 21) by means of a printer (2), wherein the transfer ink or subliming ink (15) is included in at least one ink cassette or cartridge (4).

7. A method according to claim 6, characterized in that the or each printing is of multicolored design, wherein the ink (15), during or after the application thereof, is dried at least partly through heating, said heating at least partly providing the transfer of the ink (15) to and/or in the synthetic fibers (14, 24).

8. A method according to any one of the preceding claims, characterized in that as textile label (1, 21), a heat-sealable textile label is used, wherein a backing (9) is provided on the side of the textile label facing away from the top layer (6, 26) to be printed.

9. A method according to claim 8, characterized in that as backing (9) a thermally insulating backing is used.

10. A method according to claim 8 or 9, characterized in that the backing (9) is detachably connected to the side of the textile label (1, 21) facing away from the top layer, preferably by means of an adhesive layer (8), wherein during the printing of the textile label (1, 21), the backing (9) remains connected to the textile label in a position in which said side of the textile label is covered.

11. A method according to any one of claims 8-10, characterized in that a number of textile labels (1, 21) are jointly provided on one backing (9).

12. A method according to claim 11, characterized in that the backing (9) with the textile labels (1, 21) is designed as a sheet for feeding through a printer (2).

13. A method according to claim 6 and any one of claims 7-10, characterized in that as printer (2), a heat-generating printer is used, in particular a printer of the ink jet, bubble jet or laser jet or laser-type.

14. An apparatus for use in a method according to any one of the preceding claims, characterized in that the apparatus comprises a printer (2) of a heat-generating type, in particular an ink jet, bubble jet, laser jet or laser printer, comprising at least one ink container (4) containing transfer ink or subliming ink (15).

15. An ink container, in particular an ink cartridge or ink cassette (4), for use in an apparatus according to claim 14, containing transfer ink or subliming ink (15).

16. A textile label suitable for use in a method according to any one of claims 1-11.

17. A textile label according to claim 16, characterized in that the label (1, 21) is on one side provided with a thermally bondable layer (7), wherein on the same side of the label, a further adhesive layer (8) is included, said adhesive layer (8) being adapted for at least adhering the label (1, 21) between 0-60°C on a bonding surface, for positioning the label (1, 21) thereon temporarily and detachably, and for retaining the label (1, 21) on the bonding surface during a following heating of the label (1, 21) for adhering said label definitively to the bonding surface by means of the thermally bondable layer (7).

18. A textile label according to claim 17, characterized in that the adhesive layer (8) comprises pressure-sensitive adhesive.

19. A textile label according to claim 17 or 18, characterized in that the thermally bondable layer is formed by a thermoplastic layer (7).

20. A textile label according to any one of claims 17-19, characterized in that the adhesive layer (8) forms a closed layer (8) at least along the edges of the label (1, 21) and preferably below the entire label (1, 21), wherein the thermally bondable layer (7) is included between the adhesive layer (8) and a textile top layer (6) of the textile label (1, 21).

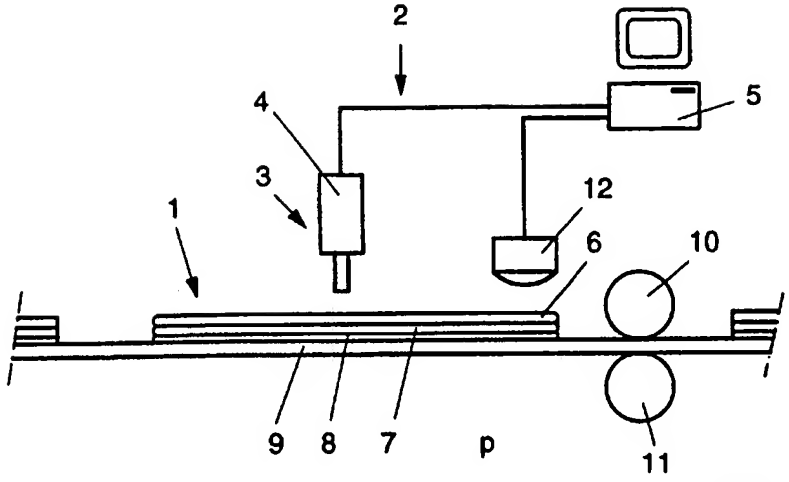

FIG. 1

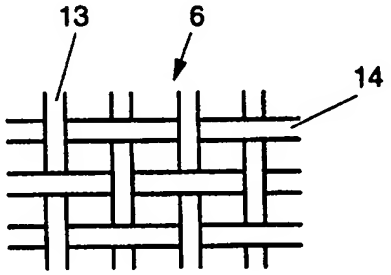

FIG. 2

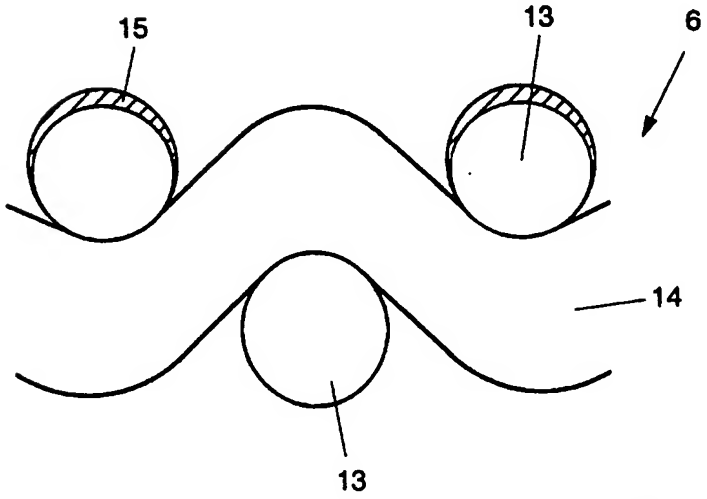

FIG. 3A

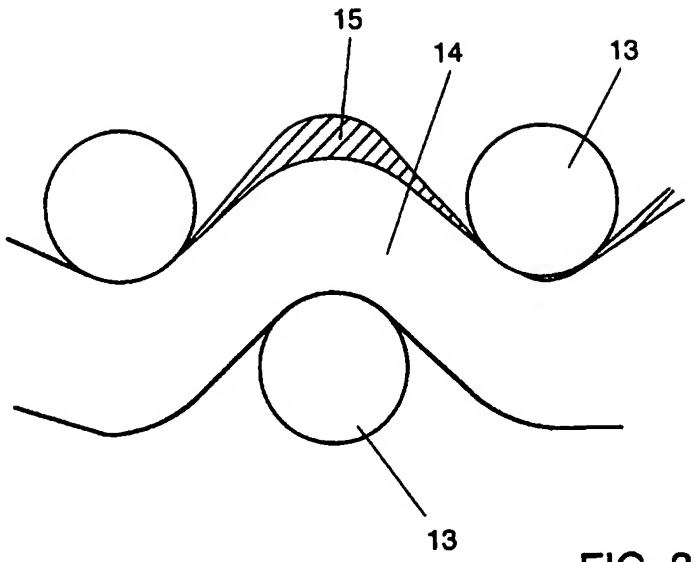

FIG. 3B

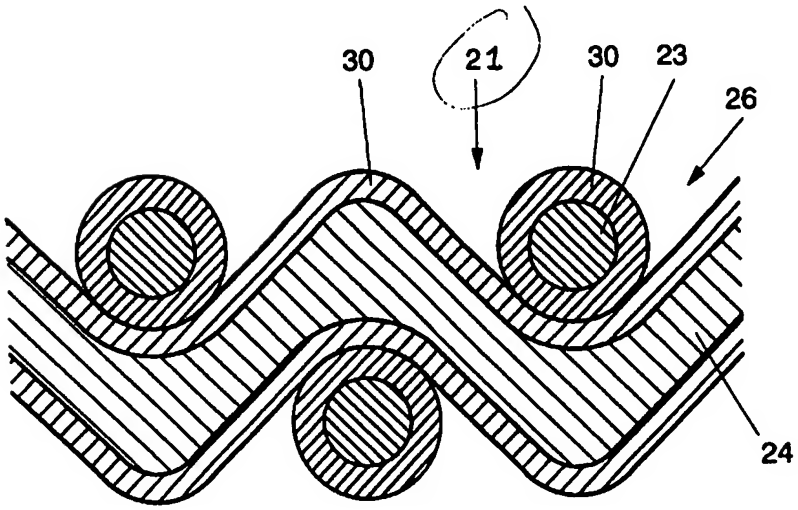

FIG. 4

INTERNATIONAL SEARCH REPORT

Interna I Application No
PCT/NL 97/00426

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 D06P5/00 D06P3/82 . D06Q1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 D06P D06Q D06M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	. DATABASE WPI Section Ch, Week 9333 Derwent Publications Ltd., London, GB; Class A97, AN 93-260729 XP002029105 & JP 05 173 486 A (MITSUBISHI RAYON CO LTD) , 13 July 1993 see abstract ---	1-20
A	PATENT ABSTRACTS OF JAPAN vol. 018, no. 484 (P-1798), 8 September 1994 & JP 06 161357 A (DYNIC CORP), 7 June 1994, see abstract --- -/--	1-20

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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1

Date of the actual completion of the international search	Date of mailing of the international search report
4 November 1997	13. 11. 97
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Blas, V

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Interna l Application No
PCT/NL 97/00426

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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A	EP 0 184 925 A (MAHN JOHN E SR) 18 June 1986 see the whole document	1-20
A	EP 0 568 709 A (TORAY INDUSTRIES) 10 November 1993 see abstract; claims	1-20
A	WO 93 04855 A (MAHN JOHN E SR) 18 March 1993 see claims	1-20
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A	US 2 629 647 A (FRANCES JOY PITT) 24 February 1953 see the whole document	1
A	AU 453 786 B (IMPERIAL CHEMICAL INDUSTRIES LIMITED) 25 September 1974 see claims	1
A	EP 0 385 327 A (MODE BEHEER BOXMEER B V) 5 September 1990 see the whole document	1

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

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